

years ago. In fact, he considers it totally wrong. In this conclusion Mr. Pergande, the best informed student of ants in America, agrees with Mr. Ashmead. Mr. Schwarz, in substantiation of this view, said that *Labidus* has never been found east of the arid region of the United States, whereas *Eciton* occurs in North Carolina. The Rev. P. Jerome Schmitt has found the female of *Eciton* in North Carolina, and possesses an excellent drawing of it, but although he has had it for more than two years, he has not yet published it. Referring to Mr. Cockerell's statements regarding the different bees visiting the same species of flower in different localities, Mr. Schwarz did not consider it at all significant, since no bees seem to be confined to single kinds of plants. He further mentioned Mr. Cockerell's custom of naming bees after plants which he had found them to visit, and thought that this custom was unwise. Mr. Benton agreed with the last speaker and stated that bees visit flowers for honey, and that in different atmospheric conditions the honey supply of different plants varies greatly, so that honey-collecting bees are forced, on occasion, to visit different species of plants.

—Mr. Schwarz presented the following :

NOTES ON THE LERP INSECTS (PSYLLIDÆ)
OF AUSTRALIA.

By E. A. SCHWARZ.

For more than 60 years it has been known that there occurs on the leaves of *Eucalyptus* trees of Australia and Tasmania a substance called Laap or Lerp by the natives and which is used by the latter as an article of food. The first scientific investigation of one of these objects was published in 1849, in the *Edinburg New Philosophical Journal*,* by Dr. Anderson, who made a chemical analysis of Lerp but remained ignorant regarding its origin. In the same year Mr. Newport surmised that Lerp was the product of an insect and not a mere exudation of the plant.

In 1850 Mr. Thomas Dobson published an illustrated paper on this subject in the first volume of the *Papers and Proceedings of the Royal Society of Van Diemen's Land*.* A reprint, with additional figures and an appendix apparently written by "J. M.," appeared in the *Transactions of the Microscopical Society* (2), vol. 5, 1857, p. 123-130, under the title "On Laap, or Lerp,

* I have not seen this paper, nor is it mentioned in Hagen's *Bibliotheca*.

the cup-like coverings of Psyllidæ found on the leaves of certain Eucalypti." In this remarkable and often quoted paper, which still remains the most important contribution to our knowledge of this subject, Mr. Dobson proves that the Lerp objects are the cases spun by the larvæ of certain Psyllids. Three different forms of Lerp are described by him, two of the imago Psyllids figured but only one described and named *Psylla eucalypti*; the third Psyllid is only briefly mentioned.

In 1879, Dr. V. Signoret (Ann. Soc. Ent. France, Bulletin, p. LXXXV) proposed the new genus *Spondyliaspis* of the family Aleurodidæ, founded solely upon what Signoret considered as the scale of the insect. He had seen only dried-up specimens of larvæ or pupæ found beneath these scales, and from the fact that they showed four wing-pads correctly concluded that the insects could not belong to the Coccidæ. The scales are described as being of the form of a conical shell (coquille) with a number of external ridges which are either spinous or smooth. The three species described by him (*S. spinosulus*, *cereus*, and *bancrofti*) are distinguished by the color of the shell and the number and nature of the ridges.

In 1881 (l. c., Bulletin, p. CLVIII) Signoret returns to this subject and states that his genus *Spondyliaspis* was identical with Maskell's genus *Inglisia*, described as a Coccid.

In 1883 Mr. J. G. Otto Tepper (Journ. Linn. Soc., 17, No. 99, p. 109) published some "Remarks on the Manna or Lerp Insect of South Australia" in which he confirms Mr. Dobson's discovery regarding the origin of lerp.

In 1891 (Internal. Journ. Microscopy, 3rd series, vol. I, No 3, p. 87) appeared, without indication as to the author, a figure of a specimen of lerp which is apparently identical with one of the lerp specimens figured by Dobson; the few lines of text accompanying this figure do not convey new information.

According to the minutes of the Proceedings of Linn. Soc. New South Wales (2), vol. IX, November 28, 1894, Mr. A. Sidney Olliff exhibited a *Psylla* from West Australia "which makes elongate semi-transparent, horny larval coverings on the foliage of *Eucalyptus rudis*. In structure and habits it is closely related to *Psylla eucalypti*, and it is proposed by Mr. Olliff to call it *Psylla periculosa*." No description of this species has ever been published.

Finally, in 1896, Mr. W. M. Maskell in his Monograph of the Aleurodidæ (Trans. New Zealand Institute, vol. 38, p. 411) vigorously objects to Signoret's interpretation of his genus *Inglisia* which is a true Coccid, and adds that from specimens received from Signoret himself there was no doubt that the genus

Spondyliaspis Sign. was identical with some of the Lerp Psyllids described by Dobson. In this statement Mr. Maskell is no doubt correct.

To sum up our knowledge of Lerp insects, there are, in Australia and Tasmania, various, probably many, species of Psyllidæ the larvæ of which construct cases of remarkable shape and often great beauty on the leaves of Eucalyptus trees. These structures are not merely waxy excretions which harden upon exposure to the air, but they are spun by the larva, each case being inhabited and constructed by a single larva. Regarding the mode of growth or rather the mode of enlarging of the cases by the larva we know very little beyond the statements in Dobson's paper; in fact the entire biology of these interesting insects is but imperfectly understood. I have seen myself only a few lerp cases collected by Mr. A. Koebele during his first trip to Australia, and which are now preserved in the collection of the U. S. Department of Agriculture, but among the numerous imago Psyllids found by him on Eucalyptus trees there are two species which are unquestionably congeneric with Dobson's *Psylla eucalypti* although they radically differ from the genus *Psylla* of modern authors. The lerp from which Dobson obtained his species evidently agrees structurally with that upon which Signoret established his genus *Spondyliaspis*, and it seems to me that we have to adopt this name although the genus has been founded solely upon characters derived from the cases constructed by the larva. The following is a description founded upon characters of the perfect insect.

SPONDYLIASPIS Signoret.

Body slender, dorsal surface very little convex longitudinally; head hardly deflexed, surface flattened; vertex gradually narrowing each side at the insertion of the antennæ, along the median line much longer than half its width at base; frontal processes very long, cylindrical, parallel porrect and abruptly depressed below the level of the vertex; eyes large, convex, projecting laterally; tempora slightly developed; anterior ocellus visible from above; antennæ long, filiform, third joint the longest.

Pronotum large, very little convex laterally, truncate in front, slightly emarginate behind, lateral impressions distinct; dorsulum transverse, not longer than the pronotum, equally moderately lobed in front and behind.

Fore-wings membranous, very long, narrow, widest a little beyond the middle, very gradually narrowing apically, tip angulated or narrowly rounded; veins moderately fine: cubitus distinctly longer than the discoidal part of subcosta, a long but narrow pterostigma, radius slightly arching throughout its length and terminating in the tip of the wing, stem

of second fork parallel with radius, cells of normal form, the marginal cells not greatly different in size.

Legs short, anterior and middle tibiæ simple, posterior tibiæ not dentate at base, but dilated at apex and produced near the outer (posterior) apical angle into a stout mucro; anterior and middle tarsi with the first joint short, simple, and much longer than the claw joint, posterior tarsi with the first joint as long as the claw joint and dilated beneath into a broad, flattened, membranous cushion-like disk; metasternal epimera very large; as long as wide, without spiniform processes.

Sixth ventral segment of the male broadly divided for the reception of the genital segment, genital plate and forceps without lateral appendages, genital segment of the female not beak-shaped, the outer valves consisting of two short plates.

Spondylaspis eucalypti Dobson (?)—General color greenish or ochereous-yellow, frontal processes often roseate except at base and tip, sides of vertex and pronotum light brownish or roseate, dorsulum with a pale median line and often margined with brown or black; abdomen above usually blackish, the segments margined behind with green, or red, or yellow, underside pale yellow or greenish, side pieces of mesonotum bordered with black, upper edge of fore and middle femora often brownish.

Head porrect or very little inclined, truncate behind; vertex along the median line much longer than on the sides, and also much longer than half its width at base, sides parallel between the eyes, then angulated and gradually narrowing and triangularly produced, front edge rather acute, discal impressions very conspicuous and of dark color, frontal processes abruptly depressed below the level of the vertex and a little more inclined, slightly longer than the vertex along its median line, cylindrical, not divergent but not contiguous, hairy; tempora visible behind the eyes and forming a distinct angle with the hind margin of the head; antennæ reaching to the end of the body, 3rd joint one-third longer than the 4th, joints 4-8 slender, very slightly decreasing in length, joints 9 and 10 together a little shorter than the 8th; clypeus knob-shaped, beak hardly projecting above the coxæ.

Pronotum a little more than half the length of the vertex and about as long as the dorsulum, very little convex transversally, often with a fine median line; dorsulum twice wider than long, its front margin overlapped by the dorsulum, color very variable but apparently never with decided darker markings.

Fore-wings hyaline or slightly whitish, veins fine, brownish, basal and discoidal parts of subcosta piceous and much stronger than the other veins; pterostigma very long, closed, tolerably wide at base; radius parallel with costa except near its terminus, very slightly and evenly arched; stem of second fork parallel with radius and forming no angle with the fourth furcal; stem of first fork more than twice shorter than that of second fork, and slightly longer than the cubitus; first furcal slightly shorter

than the stem, terminating obliquely upon the costa and two and one-half times shorter than the second furcal, with which it forms an oblique angle; second furcal gently curved throughout its length and terminating obliquely upon the costa; third furcal slightly shorter than the fourth, which is about as long as the second furcal; radial cell slightly narrower than the discoidal cell, which is nearly of the same width as the cubital cell, the latter not narrowed at middle; margin of anterior basal cell flattened out, limited internally by a fine vein; brachium reaching the apical corner of the posterior basal cell.

♂ Genital segment very large, completely dividing the sixth ventral segment, honey-yellow, plate and forceps usually darker; genital plate longer than the segment, perfectly straight, about three times longer than wide, not narrowing apically, broadly rounded at tip; forceps much narrower and but little lower than the plate, its front edge slightly concave at basal half and convex at apical third, its posterior edge nearly straight, tip acute and pointing backward.

♀ Only four ventral segments are visible in addition to the genital segment; the latter consisting of two very short plates which (at least in dried specimens) do not meet; upper plate as long as the preceding ventral segment, either horizontally projecting or declivous, broadly rounded at tip, lower plate only half the length of the upper one, rapidly narrowing into an extremely small acute point, lower edge convex.

Length (to tip of wings) 3.50-4 mm.

Described from several specimens collected by Mr. Albert Koebele on *Eucalyptus leucoxylon* in Australia (probably South Australia). Specimens typical of the above description are in the U. S. National Museum (collection Department of Agriculture), No. 3793.

The genus *Spondyliaspis* differs from all Psyllid genera known to me by the peculiar structure of the hind tibiae and hind tarsi, and since it seems to me that these characters possess more than generic value, the erection of a new subfamily, *Spondyliaspinæ*, of the true Psyllidæ (as contrasted with the Liviidæ) is proposed for this genus. The tarsal peculiarity has already been observed by Dobson, who refers to it in the following words: "The feet are furnished with two hooks and a small membranous bladder. These vesicular appendages, as well as the antennæ, are continually in motion." In the dried specimens the cushion-like expansion of the hind tarsus is probably much less conspicuous than in the living ones. In the shape of the body this genus bears a considerable resemblance to the genus *Flohria* Læw, of the tribe Psyllini.

There is, of course, considerable doubt as to the specific identity of this species with Dobson's *Psylla eucalypti*, the imago of which is described only in a general way, but I am

unwilling to introduce a new name in view of the possibility that one of the three specific names proposed by Signoret for larval cases may be applicable. The synonymy of these Lerp Psyllids will remain in an unsettled condition as long as the life-history of each species is not properly known. Dobson's species were collected near Hobart Town, Tasmania; Signoret's larval cases come from Brisbane, while Koebele's Australian Psyllidæ are unfortunately without precise locality. Among Koebele's material there is a second species of *Spondyliaspis*, but represented only by a few specimens.

What appears to be an undescribed genus of Lerp Psyllids is represented among Koebele's material by several species, one of which has been bred by him from its larval case. The latter evidently belongs to the third form of lerp described by Dobson, and is apparently referred to in Intern. Journ. Microscopy, 1891, p. 87, as "exquisite examples of miniature basket work." Dobson speaks of it as "surpassing in beauty and structural development the species already described. Its form is remarkable, like to that of one valve of cockle shell." With its edge the shell rests upon the surface of the leaf, but only the "hinge," or posterior vertical side, is firmly attached thereto. In the specimens before me the hinge is the only solid part of the structure, apparently wax-like in texture, of a yellowish-white color at the base and reddish at the outer circumference. The rest of the structure consists entirely of open basket work, the longitudinal threads radiating from the hinge and symmetrically arching over until they reach the surface of the leaf. In one of the specimens I count 28 of these threads, which are yellowish white at their base, where they are close together, and of reddish color on the roof and anterior side of the shell. The transverse threads are much finer than the longitudinal ones, of the same coloration as the latter, closely approximated near the hinge and forming with the longitudinal threads quadrate or transverse meshes. The entire shell is unproportionally large for the size of the insect, but I suppose that the larva or pupa inhabiting the same is covered with a copious layer of woolly excretion which entirely fills the case. The solid part of the hinge I take to represent the first stage of the structure exuded by the larva and which, like a scale, rests flat upon the leaf; the reddish portion of the hinge, the whitish and reddish portions of the threads probably represent the successive stages in the construction of the lerp.

The imagoes bred from this lerp are more gaily colored but much less remarkable in structure than the species of *Spondyliaspis*. In describing one of the species I gladly accept for it the very appropriate generic name kindly proposed by Dr. Th. N. Gill.

CARDIASPIS nov. gen.

Body stout, head vertical, pronotum and dorsulum strongly ascending posteriorly; head emarginate posteriorly, vertex flat, sinuately narrowing each side at the insertion of the antennæ, its front edge slightly triangularly produced each side of the anterior ocellus; frontal processes sharply separated from the vertex, slightly depressed below its level and represented by two large, slightly transverse lobes which are contiguous along the median line and shorter than the vertex; antennæ stout, slightly longer than the width of the head (including the eyes), third joint slightly longer than the fourth; eyes large, globular, projecting slightly beyond the sides of the pronotum and occupying the entire side of the head; tempora not developed; anterior ocellus not visible from above on account of the vertical position of the head.

Pronotum greatly convex transversely, lateral impressions large and deep; dorsulum at middle nearly twice shorter than its width and less than twice the length of the pronotum; its anterior margin distinctly more arched than the posterior margin; mesonotum very little convex longitudinally; side pieces of pro- and mesosternum bulging and very prominent.

Anterior wings hyaline, elongate-oval, nearly twice as long as the body, transparent, at apical third very little wider than at middle, thence gradually narrowing to the apex, which is rather narrowly rounded; veins fine, none of them much curving, petiolus cubiti distinctly longer than the discoidal part of the subcosta, a large pterostigma, tip of wing at the termination of the fourth furcal; cells of normal shape, anterior basal cell deeply concave, with a wide, flattened margin, marginal cells moderately large, the second distinctly larger than the first.

Epimera of metasternum greatly developed, transverse, spiniform processes very small, vertical. Legs short and robust, hind tibiæ without basal tooth, tarsi normal.

Following Dr. Fr. Loew's arrangements of Psyllidæ, this genus belongs to the subfamily Psyllinæ and the tribe Aphalarini. It is distinguished from all described genera of this tribe by its vertical head and the form of the frontal processes.

Cardiaspis artifex n. sp.—Color of upper side pale ochre-yellow with reddish or reddish-brown markings of variable extent and intensity; frontal processes usually bright red; abdomen above usually blackish, each segment margined behind with red or yellow; antennæ pale; side pieces of sternum sometimes bright red; legs pale, femora dusky; epimera of metasternum pale. Vertex along the median line distinctly longer than half its width at base, discal impressions large, black; frontal processes three-fourths as long as the vertex at middle, each process subquadrate with the apical edge slightly obliquely truncate; antennæ slightly longer than the width of the head, second joint quadrate, third joint but slightly longer

than the fourth, joints 5-8 subequal in length, each nearly as long as the fourth, joints 9 and 10 almost connate, together decidedly longer than the eighth.

Pronotum half as long as the vertex at middle, pale, with a fine black median line; dorsulum pale at base and on the sides, anteriorly with a large reddish or light brownish spot which is sometimes divided; mesonotum very little convex longitudinally, pale, with a fine, dark, median line, and on each side thereof with two wide brownish or reddish stripes.

Anterior wings slightly whitish, at tip not quite regularly rounded, the greater part of the curvature being formed by the posterior margin; veins reddish at the basal portion of the wing, more yellowish apically; cubitus about one-fifth longer than the discoidal part of subcosta; pterostigma elongate-triangular, closed in front, slightly more opaque than the rest of the wing; radius very slightly arching, forming a very oblique angle with the radial part of subcosta; stem of second fork parallel with radius and nearly twice as long as the stem of first fork; first furcal more than twice shorter than the second, and terminating obliquely upon the costa; second furcal nearly straight, about as long as the fourth, and terminating very obliquely upon the costa; third furcal distinctly shorter than the fourth, which runs into the tip of the wing and forms a hardly perceptible angle with its stem; first marginal cell more than twice longer than high, second marginal cell much higher than its width at the margin. Abdomen very robust, slightly widening apically.

Male, unknown.

Female: Genital segment very short and not beak-like; upper genital plate broad, slightly longer than wide at base, moderately declivous, narrowing posteriorly, and broadly rounded at apex; lower plate represented by a very short, transverse band which is widely emarginate behind.

Length, to tip of wings, 3.2-3.5 mm.

Type, No. 3794, U. S. National Museum (collection U. S. Dept. of Agriculture).

Hab., South Australia, on *Eucalyptus leucoxylon* (A. Kæbele).

Described from three female specimens, in which the abdominal structure cannot be fully studied. From a male of another species of this genus which is before me in some ill-preserved specimens, it can be seen that both the genital plate and the forceps are simple and straight, the latter narrower and higher than the former.

In discussion Mr. Howard referred to the adoption by Mr. Schwarz of the generic name *Spondyliaspis* of Signoret and questioned whether it was necessary or even advisable to adopt a name under such circumstances. He introduced as a practi-